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VIKING PUMP

TECHNICAL SERVICE MANUAL

INDUSTRIAL HEAVY DUTY MOTOR SPEED PUMPS
SERIES 4076 AND 4176
SIZES KE, KKE AND LQE

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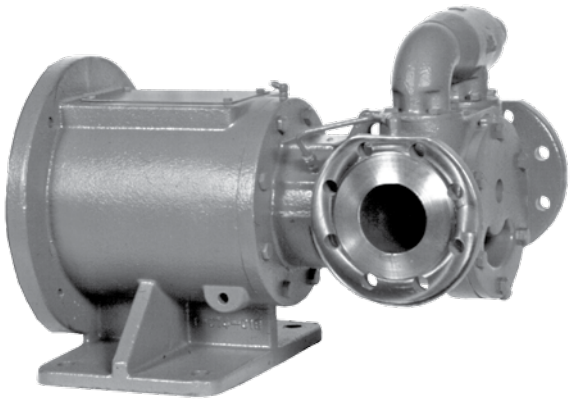


FIGURE 1

Model KKE4076M
(Shown with relief valve on pump casing and flange mounted bracket - M Drive)

INTRODUCTION

The illustrations used in this manual are for identification purposes only and cannot be used for ordering parts. Obtain a parts list from the factory or a Viking® representative. Always give complete name of part, part number and material with model number and serial number of pump when ordering repair parts. The pump model number and serial number are on the nameplate.

This manual deals only with Viking 4076/4176 pumps. Specifications and recommendations are listed in Catalog Section 710.

UNMOUNTED PUMP		UNITS
Flange Mounted	Foot Mounted	Units are designated by the unmounted pump model numbers followed by a letter indicating drive style. **M** = Horizontal **D** = Direct Drive
KE4076 KKE4076 LQE4076	LQE4176	

TABLE 1

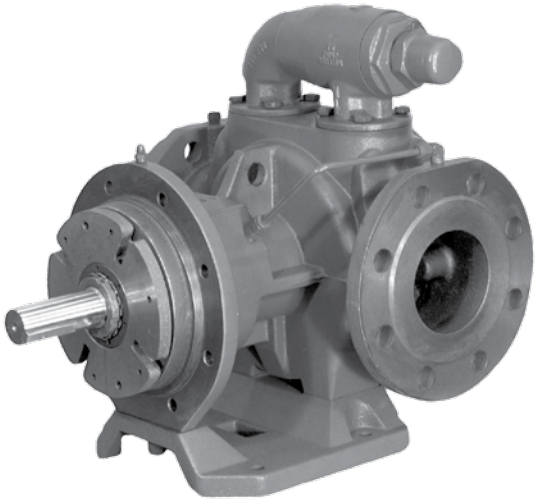


FIGURE 2

Model LQE4176
(Shown with relief valve on pump casing and foot mounting)

SAFETY INFORMATION AND INSTRUCTIONS

IMPROPER INSTALLATION, OPERATION OR MAINTENANCE OF PUMP MAY CAUSE SERIOUS INJURY OR DEATH AND/OR RESULT IN DAMAGE TO PUMP AND/OR OTHER EQUIPMENT. VIKING'S WARRANTY DOES NOT COVER FAILURE DUE TO IMPROPER INSTALLATION, OPERATION OR MAINTENANCE.

THIS INFORMATION MUST BE FULLY READ BEFORE BEGINNING INSTALLATION, OPERATION OR MAINTENANCE OF PUMP AND MUST BE KEPT WITH PUMP. PUMP MUST BE INSTALLED, OPERATED AND MAINTAINED ONLY BY SUITABLY TRAINED AND QUALIFIED PERSONS.

THE FOLLOWING SAFETY INSTRUCTIONS MUST BE FOLLOWED AND ADHERED TO AT ALL TIMES.

Symbol Legend :

Danger - Failure to follow the indicated instruction may result in serious injury or death.

WARNING

Warning - In addition to possible serious injury or death, failure to follow the indicated instruction may cause damage to pump and/or other equipment.

BEFORE opening any liquid chamber (pumping chamber, reservoir, relief valve adjusting cap fitting, etc.) be sure that :

- Any pressure in the chamber has been completely vented through the suction or discharge lines or other appropriate openings or connections.
- The pump drive system means (motor, turbine, engine, etc.) has been "locked out" or otherwise been made non-operational so that it cannot be started while work is being done on the pump.
- You know what material the pump has been handling, have obtained a material safety data sheet (MSDS) for the material, and understand and follow all precautions appropriate for the safe handling of the material.

BEFORE operating the pump, be sure all drive guards are in place.

DO NOT operate pump if the suction or discharge piping is not connected.

DO NOT place fingers into the pumping chamber or its connection ports or into any part of the drive train if there is **any possibility** of the pump shafts being rotated.

WARNING

DO NOT exceed the pumps rated pressure, speed, and temperature, or change the system/duty parameters from those the pump was originally supplied, without confirming its suitability for the new service.

WARNING

BEFORE operating the pump, be sure that:

- It is clean and free from debris
- all valves in the suction and discharge pipelines are fully opened.
- All piping connected to the pump is fully supported and correctly aligned with the pump.
- Pump rotation is correct for the desired direction of flow.

WARNING

INSTALL pressure gauges/sensors next to the pump suction and discharge connections to monitor pressures.

WARNING

USE extreme caution when lifting the pump. Suitable lifting devices should be used when appropriate. Lifting eyes installed on the pump must be used **only** to lift the pump, **not** the pump with drive and/or base plate. If the pump is mounted on a base plate, the base plate must be used for all lifting purposes. If slings are used for lifting, they must be safely and securely attached. For weight of the pump alone (which does not include the drive and/or base plate) refer to the Viking Pump product catalog.

DO NOT attempt to dismantle a pressure relief valve that has not had the spring pressure relieved or is mounted on a pump that is operating.

AVOID contact with hot areas of the pump and/or drive. Certain operating conditions, temperature control devices (jackets, heat-tracing, etc.), improper installation, improper operation, and improper maintenance can all cause high temperatures on the pump and/or drive.

WARNING

THE PUMP must be provided with pressure protection. This may be provided through a relief valve mounted directly on the pump, an in-line pressure relief valve, a torque limiting device, or a rupture disk. If pump rotation may be reversed during operation, pressure protection must be provided on ***both*** sides of pump. Relief valve adjusting screw caps must always point towards suction side of the pump. If pump rotation is reversed, position of the relief valve must be changed. Pressure relief valves cannot be used to control pump flow or regulate discharge pressure. For additional information, refer to Viking Pump's Technical Service Manual TSM 000 and Engineering Service Bulletin ESB-31.

WARNING

THE PUMP must be installed in a matter that allows safe access for routine maintenance and for inspection during operation to check for leakage and monitor pump operation.

SPECIAL INFORMATION

DANGER !

Before opening any Viking pump liquid chamber (pumping chamber, reservoir, relief valve adjusting cap fitting, etc.) be sure:

1. **That any pressure in the chamber has been completely vented through the suction or discharge lines or other appropriate openings or connections.**
2. **That the driving means (motor, turbine, engine, etc.) has been "locked out" or made non-operational so that it cannot be started while work is being done on the pump.**
3. **That you know what liquid the pump has been handling and the precautions necessary to safely handle the liquid. Obtain a material safety data sheet (MSDS) for the liquid to be sure these precautions are understood.**

Failure to follow the above listed precautionary measures may result in serious injury or death.

ROTATION:

See **FIGURE 3**. Viking 4076/4176 pumps are directional due to the loading groove in the head. If rotation is to be reversed, the head and pin assembly will have to be replaced and pump relief valve must be reversed so adjusting screw cap always points to suction side of pump. Standard rotation is clockwise, as viewed from the shaft end.

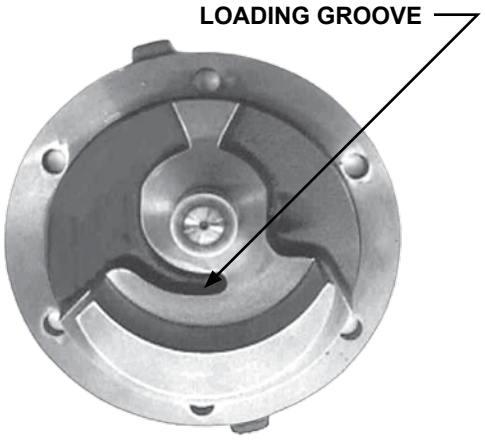


FIGURE 3

(Head - Counter Clockwise Rotation Shown)

PRESSURE RELIEF VALVES:

Relief valves are mounted on the casing.

Pumps not furnished with a relief valve must be provided with some means of pressure protection (inline pressure relief valve, torque limiting device, or rupture disk).

If pump rotation is to be reversed during operation, pressure protection must be provided on both sides of the pump. See also "**ROTATION"**.

Relief valve adjusting screw cap must always point towards the suction side of the pump.

Pressure relief valves are intended for use as protection for the pump only and should not be used to control pump flow or regulate discharge pressure.

MAINTENANCE

Viking 4076/4176 pumps are designed for long, trouble-free service life under a variety of application conditions with a minimum of maintenance. The following points will help provide long service life.

BUSHINGS:

Note that the bushings used in this pump do not require any external source of lubricant.

CLEANING THE PUMP:

Keep the pump as clean as possible. This will facilitate inspection, adjustment and repair work and help prevent overlooking a dirt covered grease fitting.

STORAGE:

If a new pump is to be stored, or not used for six months or more, pump must be drained and a light coat of non-detergent SAE 30 weight oil must be applied to all internal pump parts. Lubricate the fittings and apply grease to the pump shaft extension. Viking suggests rotating the pump shaft by hand one complete revolution every 30 days to circulate the oil.

SUGGESTED REPAIR TOOLS:

The following tools must be available to properly repair Viking series 4076/4176 pumps. These tools are in addition to standard mechanics' tools such as open end wrenches, pliers and screw drivers. Most items can be obtained from an industrial supply house.

1. Soft headed hammer
2. Allen wrenches
3. Bearing locknut spanner wrench
4. Spanner wrench, adjustable pin type for use on bearing housing end cap
5. Brass bar or wood block
6. Arbor press

DISASSEMBLY

DANGER !

Before opening any Viking pump liquid chamber (pumping chamber, reservoir, relief valve adjusting cap fitting, etc.) Be sure:

1. **That any pressure in the chamber has been completely vented through the suction or discharge lines or other appropriate openings or connections.**
2. **That the driving means (motor, turbine, engine, etc.) has been "locked out" or made non-operational so that it cannot be started while work is being done on pump.**
3. **That you know what liquid the pump has been handling and the precautions necessary to safely handle the liquid. Obtain a material safety data sheet (MSDS) for the liquid to be sure these precautions are understood.**

Failure to follow the above listed precautionary measures may result in serious injury or death.

1. Remove the head capscrews. Remove the head of the pump. *Do not allow the idler to fall from the idler pin.* To prevent this from happening, tilt the top of the head back when removing. Avoid damaging the head o-ring. If the pump is furnished with a jacketed head plate, it will separate from the head when the capscrews are removed. Avoid damaging the jacketed head plate o-ring.

2. Remove the idler and bushing assembly.

3. Insert a length of hardwood or brass through the port opening between the rotor teeth to keep the shaft from turning. Straighten out the lock washer tab, and with a spanner wrench remove the locknut and lock washer from the shaft. Remove the length of hardwood or brass from the port opening.

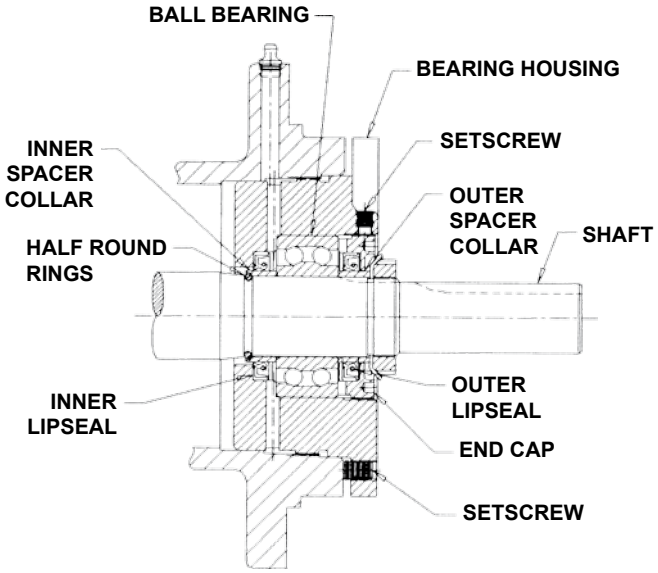
4. Loosen the two setscrews in the face of the bearing housing and unthread the bearing housing assembly from the bracket. The end of the bearing housing contains the mechanical seal seat. Avoid damaging this surface. See **FIGURE 4.**

5. Remove the pair of half round rings under the inner spacer collar from the shaft.

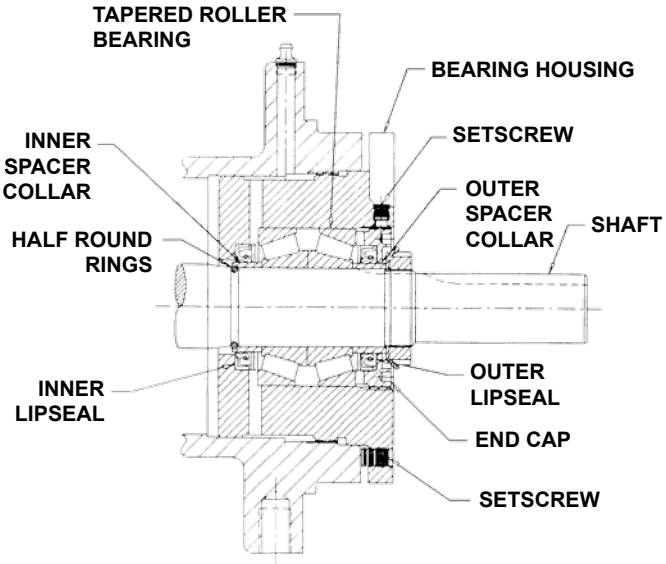
6. Remove the rotor/shaft assembly, being careful to avoid damaging the seal faces and casing bushing.

7. Remove the rotating member of the mechanical seal from the shaft only if the seal is to be replaced.

8. Remove the mechanical seal holder plate and stationary member of the mechanical seal. Avoid damaging the seal plate holder o-ring.



BEARING HOUSING ASSEMBLY - KE/KKE
FIGURE 4



BEARING HOUSING ASSEMBLY - LQE
FIGURE 5

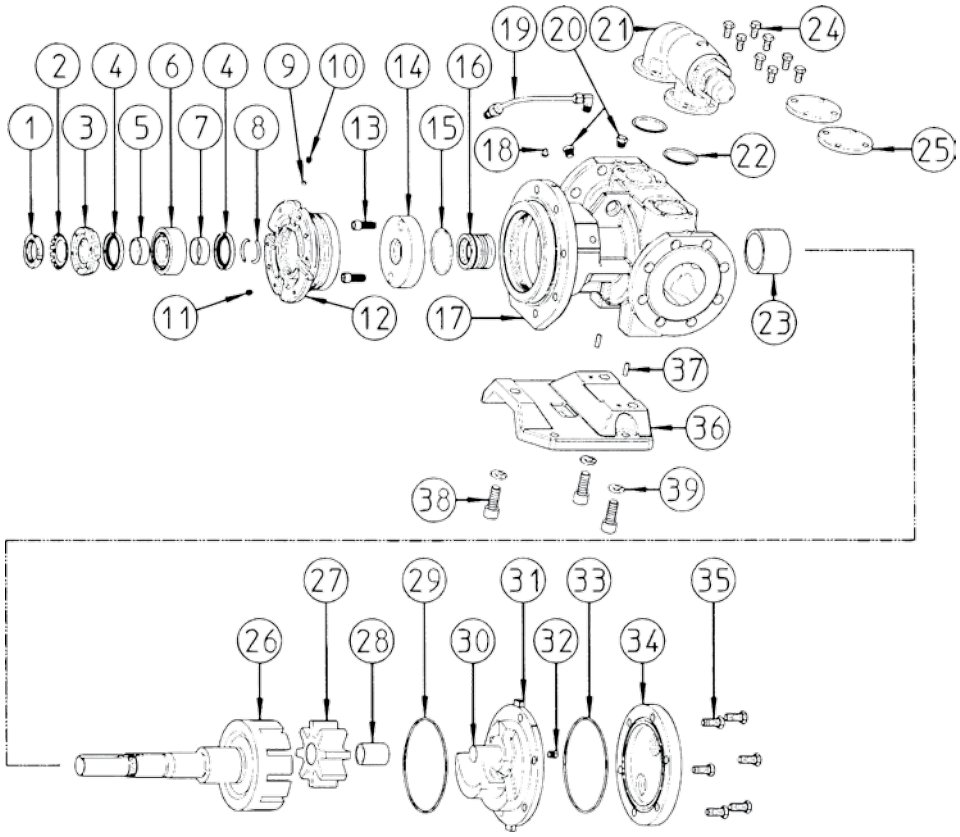


FIGURE 6
EXPLODED VIEW OF VIKING SERIES 4076 / 4176 PUMPS

ITEM	NAME OF PART	ITEM	NAME OF PART
1	Locknut	**21**	Relief Valve
2	Lockwasher	**22**	O-Ring For Relief Valve / Cover Plates
3	End Cap	**23**	Casing Bushing
4	Lip Seal (2-Req'd)	**24**	Capscrews For Relief Valve / Cover Plate (8-Req'd)
5	Bearing Spacer Collar (Outer)	**25**	Cover Plates (2-Req'd)
6	Ball Bearing - KE & KKE / Roller Bearing - LQE (2-Req'd)	**26**	Rotor and Shaft Assembly
7	Bearing Spacer Collar (Inner)	**27**	Idler and Bushing Assembly
8	Half Round Ring (2-Req'd)	**28**	Idler Bushing
9	Nylon Slug (2-Req'd)	**29**	O-Ring For Head
10	Setscrew, M8 - 1.25 x 8 mm (2-Req'd)	**30**	Lube Pin
11	Setscrew, M8 - 1.5 x 14 mm (2-Req'd)	**31**	Head and Lube Idler Pin Assembly
12	Bearing Housing	**32**	Pipe Plug, Hex Head, 1/4" BSP
13	Capscrews For Seal Plate (2-Req'd)	**33**	O-Ring For Jacketed Head Plate
14	Mechanical Seal Plate	**34**	Jacketed Head Plate
15	O-ring For Seal Plate	**35**	Head Capscrews
16	Mechanical Seal	**36**	Foot (4176 Models Only)
17	Casing and Bushing Assembly	**37**	Dowel Pins (4176 Models Only)
18	Grease Fitting, 1/8" NPT	**38**	Capscrews For Foot (4176 Models Only)
19	Flush Line Assembly	**39**	Lockwashers For Foot (4176 Models Only)
20	Pipe Plug, Hex Head, 1/4" BSP (2-Req'd)	**Not Illus.**	Pipe Flange Gasket (2-Req'd)

TABLE 2

ASSEMBLY

NOTE: *To facilitate assembly, place the pump casing so that it is standing on one of its flanges with a block of wood under the mounting flange. See **FIGURE 5**.*

1. Install the casing bushing. See "**INSTALLATION OF CARBON GRAPHITE BUSHINGS**" on page 6.
2. See **FIGURE 8**, and notes under "**MECHANICAL SEAL**" on page 6. Install the stationary member of the mechanical seal into the mechanical seal plate. Coat the mechanical seal plate o-ring with oil or grease to keep it in place and in-stall the mechanical seal holder plate into the shaft end of the casing.
3. Apply a coating of light oil onto the shaft in the seal area, then install the rotating member of the mechanical seal onto the rotor/shaft assembly.
4. Slide the rotor/shaft assembly into the casing, taking care not to damage the bushing or the seal faces.

NOTE: *When installing a new rotor/shaft assembly, use a file to carefully remove all burrs and sharp edges.*

5. Coat the head o-ring with oil or grease and slip it over the head pilot to keep it in place. Apply a coating of light oil onto the bushing ID and the crescent. Place the idler/bushing assembly onto the idler pin.

NOTE: *When installing a new head/pin assembly, use a file to carefully remove all burrs and sharp edges, especially around the loading groove.*

6. Install the head. For proper head positioning, the pin should be at the top centered between the two ports. If the pump is equipped with a jacketed head plate, install at this time. Tighten cap-screws evenly.

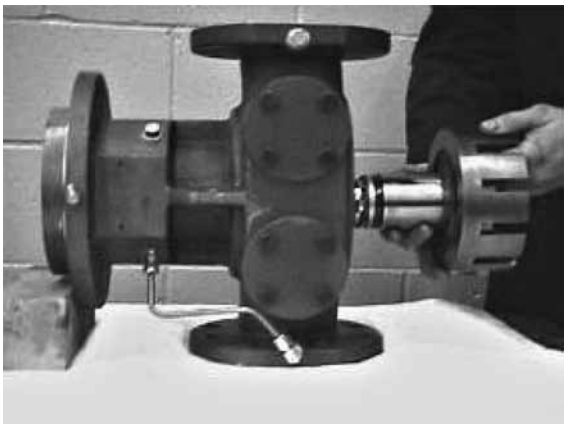
   Refer to **FIGURE 4** and **FIGURE 5** for bearing housing assembly.
7. Install the closure in the bearing housing (See the appropriate figure for lip orientation).
8. **KE and KKE PUMPS:** Pack the ball bearing with grease and push or press the bearing into the bearing housing. See **FIGURE 3** on page 2.

   LQE PUMPS: Pack tapered roller bearings with grease and press or push bearings into housing with large end of inner races together. It is possible to install bearings incorrectly. For proper assembly (See **FIGURE 5** on page 3).
9. Install the closure in the end cap (See the appropriate figure for lip orientation). Thread the end cap into the bearing housing along with outer bearing spacer collar and tighten against the bearing.

   LQE PUMPS ONLY: Tapered roller bearings re-quire preload to operate properly. To set preload tighten end cap so that inner races of bearings cannot be rotated by hand. Back the end cap off to allow inner races to rotate with slight resistance.

   Lock end cap in place with two set screws in the flange of the bearing housing.
10. Slide inner spacer collar over shaft with recessed end facing rotor.

    Place pair of half round rings on shaft and slide inner bearing spacer collar over half round rings to lock them in place.



ROTOR INSTALLATION
FIGURE 7

11. Thread the bearing housing with closures, end cap, outer bearing spacer collar and bearings in-stalled into bracket. Make sure inner spacer collar keeps split rings locked in place.
12. Insert a length of hardwood or brass through the port opening between the rotor teeth to keep the shaft from turning. Put the lock washer and lock-nut on the shaft and tighten 100 - 200 N•m and bend one tang of the lock washer into a slot of the locknut.
13. Adjust the pump end clearance as instructed in "**THRUST BEARING ADJUSTMENT**" on page 6.
14. Lubricate all grease fittings with multi-purpose grease, NLGI #2.

DANGER !

Before starting the pump, be sure all drive equipment guards are in place.

Failure to properly mount guards may result in serious injury or death.

MECHANICAL SEAL

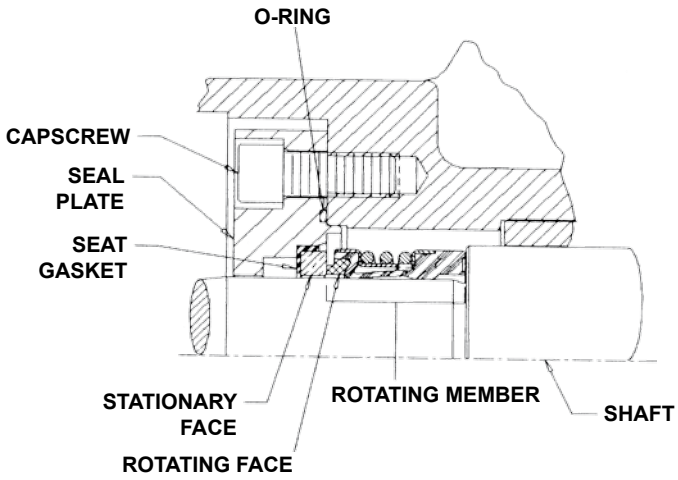
For disassembly, see **"DISASSEMBLY"** on page 4.

For assembly, see **"ASSEMBLY"**.

NOTE: Never touch the mechanical seal faces with anything except clean hands or a clean cloth. Minute particles can scratch the seal faces and cause leakage.

Always clean the rotor and shaft and seal housing bore before installing the mechanical seal. Make sure surfaces are clean and free of scratches.

There are two available mechanical seals. The standard, shown in **FIGURE 8** on page 7, is for applications pumping liquids with viscosities up to 3,500 SSU. There is also a "pin style" seal available with the stationary face pinned to the seal plate for applications pumping liquids with viscosities up to 10,000 SSU.



MECHANICAL SEAL
FIGURE 8

THRUST BEARING ADJUSTMENT

See **FIGURE 4** on page 3.

1. Loosen the two setscrews in the outer face of the bearing housing and turn the thrust bearing assembly clockwise until it can no longer be turned by hand. Back off counterclockwise until the rotor shaft can be turned by hand with a slight, noticeable drag.
2. For standard (.12 mm) end clearance, back off the thrust bearing assembly 30 mm as measured on the outside diameter of the bearing housing.
3. Tighten the two set screws with equal force against the bracket. End clearances are now set and locked.

NOTE: Be sure the shaft can rotate freely by hand. If not, back off additional length on outside diameter and check again. If there is still some noticeable drag, see **"ASSEMBLY"** on page 5, reference notes under item 4 and 5.

4. High viscosity liquids require additional end clearances. The amount of extra end clearance depends on the viscosity of the liquid pumped. For specific recommendations, consult your nearest authorized Viking Pump distributor. Each 10 mm turn on the outside diameter of the bearing housing is equivalent to an extra end clearance of (.04 mm).

INSTALLATION OF CARBON GRAPHITE BUSHINGS

When installing carbon graphite bushings, extreme care must be taken to prevent breaking. Carbon graphite is a brittle material and cracks easily. If cracked, the bushing will quickly disintegrate. Using a lubricant on the bushing and the mating part will help in installation. The additional precautions listed below must be followed for proper installation:

1. A press must be used for installation.
2. Be certain the bushing is straight.
3. Do not stop the pressing operation until the bushing is in the proper position; starting and stopping will result in a cracked bushing.
4. Check the bushing for cracks after installation.

INSTALLATION OF FOOT

Series 4176 pumps come equipped with a removable mounting foot. Removal of the foot is not normally required for maintenance. In cases where the foot needs to be replaced or is being added, use the following steps.

1. Ensure alignment pins are installed in the top of the foot prior to assembly of the foot to the casing.
2. Match the foot to the casing by inserting pins into the bottom of the casing.
3. Secure foot to casing using the socket head capscrews and lock washers. Torque capscrews to 100-110 N•m.

PRESSURE RELIEF VALVE INSTRUCTIONS

DANGER !

Before opening any Viking pump liquid chamber (pumping chamber, reservoir, relief valve adjusting cap fitting, etc.) Be sure:

1. **That any pressure in the chamber has been completely vented through the suction or discharge lines or other appropriate openings or connections.**
2. **That the driving means (motor, turbine, engine, etc.) has been "locked out" or made non-operational so that it cannot be started while work is being done on pump.**
3. **That you know what liquid the pump has been handling and the precautions necessary to safely handle the liquid. Obtain a material safety data sheet (MSDS) for the liquid to be sure these precautions are understood.**

Failure to follow above listed precautionary measures may result in serious injury or death.

RELIEF VALVE PRESSURE ADJUSTMENT:

If a new spring is installed or if the pressure setting of the pressure relief valve is changed from what the factory has set, the following instructions must be carefully followed.

1. Carefully remove the valve cap that covers the adjusting screw. **NOTE:** this cap will most likely contain liquid.
2. Loosen the locknut that locks the adjusting screw so the pressure setting will not change while the pump is in operation.
3. Install a pressure gauge in the discharge line for actual adjustment operation.
4. Turn the adjusting screw in to increase the pressure and out to decrease the pressure.
5. With the discharge line closed at a point beyond the pressure gauge, the gauge will show the maximum pressure that the valve will allow while the pump is in operation

IMPORTANT

When ordering parts for a pressure relief valve, always give the model number and serial number of the pump as it appears on the nameplate. Also specify the name of the part(s) wanted. When ordering springs, be sure to give the pressure settings desired.

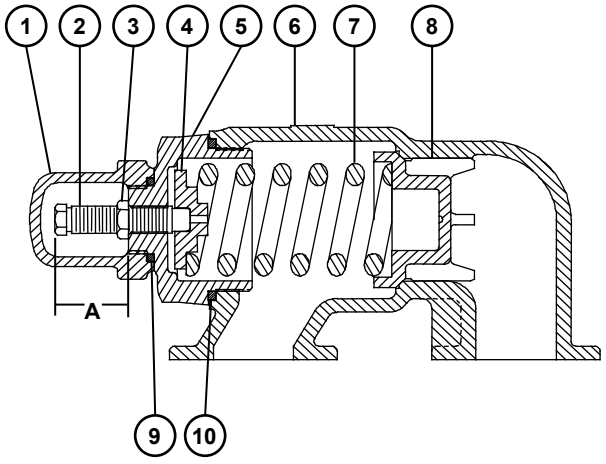


FIGURE 9

VALVE - LIST OF PARTS			
1.	Valve Cap	6.	Valve Body
2.	Adjusting Screw	7.	Valve Spring
3.	Lock Nut	8.	Poppet
4.	Spring Guide	9.	Cap Gasket
5.	Bonnet	10	Bonnet Gasket

VIKING PUMP

IDEX CORPORATION

WARRANTY

Viking warrants all products manufactured by it to be free from defects in workmanship or material for a period of one (1) year from date of startup, provided that in no event shall this warranty extend more than eighteen (18) months from the date of shipment from Viking. The warranty period for Universal Seal series pumps ONLY (Universal Seal models listed below) is three (3) years from date of startup, provided that in no event shall this warranty extend more than forty-two (42) months from the date of shipment from Viking.

UNDER NO CIRCUMSTANCES SHALL VIKING BE LIABLE UNDER THIS WARRANTY OR OTHERWISE FOR SPECIAL, INCIDENTAL, INDIRECT, CONSEQUENTIAL OR PUNITIVE DAMAGES OF ANY KIND, INCLUDING, BUT NOT LIMITED TO, LOST OR UNREALIZED SALES, REVENUES, PROFITS, INCOME, COST SAVINGS OR BUSINESS, LOST OR UNREALIZED CONTRACTS, LOSS OF GOODWILL, DAMAGE TO REPUTATION, LOSS OF PROPERTY, LOSS OF INFORMATION OR DATA, LOSS OF PRODUCTION, DOWNTIME, OR INCREASED COSTS, IN CONNECTION WITH ANY PRODUCT, EVEN IF VIKING HAS BEEN ADVISED OR PLACED ON NOTICE OF THE POSSIBILITY OF SUCH DAMAGES AND NOTWITHSTANDING THE FAILURE OF ANY ESSENTIAL PURPOSE OF ANY PRODUCT.

THIS WARRANTY IS AND SHALL BE VIKING'S SOLE AND EXCLUSIVE WARRANTY AND SHALL BE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ALL WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT ALL OF WHICH OTHER WARRANTIES ARE EXPRESSLY EXCLUDED.

See complete warranty at www.vikingpump.com.

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